

Expert Rebuttal Report of Jonathan I. Arnold, Ph.D.

Public Redacted Version

THE SUPERIOR COURT OF THE STATE OF ARIZONA
IN AND FOR THE COUNTY OF MARICOPA

STATE OF ARIZONA, *ex rel.* MARK
BRNOVICH, Attorney General,

Plaintiff,

v.

GOOGLE LLC, A Delaware Limited Liability
Company,

Defendant.

Case No. CV2020-006219

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SUBJECT TO PROTECTIVE ORDER

REBUTTAL EXPERT REPORT OF JONATHAN I. ARNOLD, PH.D.

June 8, 2022

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I. INTRODUCTION

1. My name is Jonathan I. Arnold. I have been retained by counsel for Google LLC ("Google") in connection with this proceeding in which the State of Arizona seeks remedies arising out of certain of Google's practices.

2. This report is laid out as follows. This section contains my assignment (subsection A), qualifications (subsection B), some aspects of the proceeding (subsection C), and a summary of my conclusions (subsection D). In Section II, I address the absence of any restitution analysis by Dr. Levy. In Section III, I explain the basis for my view that Dr. Levy's disgorgement analysis is flawed and unreliable. In Section IV, I explain the basis for my view that Dr. Levy's analysis of civil penalties is flawed and unreliable.

A. Assignment

3. On May 4, 2022, Dr. Daniel S. Levy, Ph.D., submitted an expert report ("Levy Report") on behalf of the State of Arizona.¹ In it, Dr. Levy offers certain opinions relating to disgorgement and civil penalties.² Google's counsel asked me to review and respond to the calculations of disgorgement damages and opinions relating to civil penalties in the Levy Report, including assessing alternative remedies, assuming liability and causation are established in some fashion.

¹ Expert Report of Daniel S. Levy, Ph.D., *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, May 4, 2022 ("Levy Report").

² Levy Report, p. 3. Specifically, as he puts it, to "provide an expert assessment as to 'any profits, gain, gross receipts or other benefit obtained by' the unlawful practice alleged by the State that should be disgorged from Google" (citing A.R.S. § 44-1428).

B. Qualifications

4. I am an economist employed by Chicago Economics Corp. I am also a Senior Consultant to Compass Lexecon, an economics, finance, and strategy consulting firm. I specialize in the application of economics to legal and regulatory issues and frequently analyze questions relating to economic loss in commercial disputes.

5. I have taught economics at The University of Chicago's Graduate School of Business (now called The University of Chicago's Booth School of Business) and the Department of Economics at The University of Chicago, as well as at other schools. I have also taught antitrust economics at Loyola University Chicago's School of Law.

6. I earned my Ph.D. and M.B.A. from The University of Chicago's Graduate School of Business and my B.A. from The University of Chicago. I am also a certified public accountant.

7. Prior to my current position, I served as Chief Economist at New York State's Office of the Attorney General ("OAG"). In this role, I served as senior policymaker on economics questions for the Attorney General—covering Economic Justice, Criminal Justice and Social Justice—as well as (i) overseeing economic analysis of key matters, (ii) retaining and supervising outside expert witnesses, and (iii) integrating economic analysis with legal analysis at OAG. This work encompassed antitrust, securities/investor protection, financial crime, labor, and environmental disputes and policy, among others.

8. I have offered expert testimony in the form of court and arbitration testimony, depositions, and affidavits on prior occasions on a variety of valuation,

finance, economics, and accounting topics, including quantification of compensatory and disgorgement remedies, among others.

9. Appendix A contains my *curriculum vitae* and lists my education and information relating to my previous employment and testimony.

10. Compass Lexecon staff have assisted me in this matter. My analyses, opinions, and conclusions are based solely on the work performed by me, and those under my supervision, through the date of this report. My hourly rate is \$1,200. My compensation is not contingent upon my opinions and conclusions, or upon the outcome of this matter.

11. The materials I have considered are listed in Appendix B. I may modify or update my opinions should additional relevant information become available which bears on the analysis, opinions, or conclusions contained in this report.

C. Selected Case Allegations Relevant to My Analysis

12. The plaintiff in this case is the State of Arizona ("Arizona"), who seeks damages based on the Arizona Consumer Fraud Act ("ACFA"). Google is the defendant and holds itself out as a firm that operates in the internet space.³

13. Arizona alleges that "[t]he tactics Google deploys to surveil its users' locations—including users in Arizona—include willfully deceptive and unfair acts and

³ Complaint for Injunctive and Other Relief, *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, May 27, 2020 ("Complaint"), ¶ 15. More particularly, Google is a technology company that provides products and services, including Search, Gmail, Chrome, Maps, and YouTube, among others. See Google, "Helpful products. Built with you in mind," available at <https://about.google/products/>.

practices within the meaning of the Arizona Consumer Fraud Act.”⁴ Through these purportedly “deceptive and unfair acts and practices,” Google is alleged to “make[] it impractical if not impossible for users to meaningfully opt-out of Google’s collection of location information, should the users seek to do so.”⁵ Arizona further alleges that “Google has engaged in these deceptive and unfair acts and practices with the purpose of enhancing its ability to collect and profit from user location information.”⁶ Based on “information and belief,” Arizona claims that “hundreds of millions of dollars of [Google’s] advertising revenues were generated from ads presented to millions of users in the State of Arizona.”⁷ I understand, however, that the Court granted summary judgment in favor of Google on Arizona’s claims related to Google’s sale of third-party advertising, finding that such sales are not sufficiently connected to the accused conduct.⁸

14. The Complaint also alleges that “[c]onsumers in Arizona have in fact been the subject of deception, deceptive/unfair acts/practices, false pretense and promises, misrepresentations, and concealment, suppression, or omission of material facts” and that “Google’s violations present a continuing harm and the unlawful acts and practices complained of here affect the public interest.”⁹ As a result, Arizona demands that Google

⁴ Complaint, ¶ 7.

⁵ Complaint, ¶ 10.

⁶ Complaint, ¶ 11.

⁷ Complaint, ¶ 11.

⁸ Court Ruling on Google’s Motion for Summary Judgment, *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, January 21, 2022, pp. 18-21.

⁹ Complaint, ¶¶ 163, 166.

disgorge “all profits, gains, gross receipts, and other benefits obtained for the period of time when it engaged in any unlawful practice.”¹⁰ Arizona further demands “restitution for Arizona consumers” for Google’s alleged “violations of the Arizona Consumer Fraud Act.”¹¹

15. I refer to Arizona’s operative claims as the “accused conduct.”

D. Summary of Conclusions

16. Based on my analysis to date, as well as my skill, knowledge, education, experience, and training, I have formed the following opinions, which I hold to a reasonable degree of certainty:

- i. Dr. Levy does not measure (or even address) the economic loss, if any, experienced by consumers resulting from the accused conduct.
- ii. Dr. Levy’s disgorgement analysis is flawed and unreliable for numerous reasons. Any one alone, or in combination, is sufficient to overstate disgorgement materially. Therefore, his quantifications should not be credited. Among other defects, he (i) fails to demonstrate a causal connection between his measure of revenues and the accused conduct; (ii) misinterprets certain Google documents on which he relies; (iii) does not make allowances for Arizona users not exposed to the accused

¹⁰ Complaint, ¶ 12.

¹¹ Complaint, ¶ 12.

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conduct, or if exposed but not misled, or if exposed and misled, would have elected to turn off certain location services and forego the benefits of the feature; and (iv) does not quantify the cost of producing Google's revenue arising from the accused conduct.

- iii. Dr. Levy's civil penalties analysis is flawed and unreliable because it overstates both the number of violations and the amount of penalties. These are major overstatements, and therefore his opinion should not be credited.

II. DR. LEVY DOES NOT ADDRESS OR CALCULATE RESTITUTION ARISING FROM THE ACCUSED CONDUCT (I.E., QUANTIFY ECONOMIC LOSSES TO CONSUMERS)

17. Restitution, which Arizona references in the Complaint but Dr. Levy fails to perform, is frequently used to remedy consumers' economic losses where liability is found in a party's favor.¹² In my experience in matters involving alleged harm to consumers, such as this matter, a compensatory measure (restitution) is typically applied because it returns the harmed parties to the same economic position that would have manifested in the absence of the accused conduct.

18. A compensatory remedy is a natural measure of damages in view of the fact that Arizona alleges consumer harm, specifically that "Google has systematically

¹² Complaint, ¶ 12 and p. 45 ("Arizona brings this action to [...] recover restitution for Arizona consumers."). For the purpose of this report, I assume that the defendant is liable for the accused conduct, as does Dr. Levy in his report. *See* Levy Report, p. 27. Accordingly, my use of the terms "lawfully" and "unlawfully" is based on my assumption that the jury finds that the accused conduct is in fact unlawful.

engaged in activities with a tendency or capacity to deceive consumers.”¹³ This notwithstanding, Dr. Levy does not quantify consumers’ economic losses from the purported unlawful conduct (nor does he even attempt to do so). He also does not show, or even contend, that users would have paid less for Nexus or Pixel smartphones, or any other Android devices, in the absence of the accused conduct. In fact, Dr. Levy does not undertake any analysis (or reference any other expert’s analysis) to demonstrate the fact of economic loss to any Arizona consumer arising from Google’s accused conduct, much less all Arizona users of Google’s products and services.

19. Instead of addressing economic harm to consumers from the alleged consumer deception, Dr. Levy purports to quantify disgorgement of Google’s revenues and profits from advertising to certain Arizona residents.¹⁴ I understand that disgorgement is a secondary remedy – i.e., disfavored when a compensatory remedy is reasonably quantifiable. This is because it does not relate to consumer harm and is, rather, focused on the accused party’s profit regardless of the fact, or magnitude, of harm.¹⁵

20. Unlike a disgorgement remedy, restitution to Arizona consumers, as a matter of economic theory and logic, requires assessing both the economic (i) losses to consumers due to the accused conduct and (ii) benefits to consumers due to the accused

¹³ Complaint, ¶ 160.

¹⁴ He also purports to quantify certain civil penalties.

¹⁵ See, e.g., Elizabeth A. Evans, Phil J. Innes, and Daniel G. Lentz. “Damages Theories and Causation Issues,” in *Litigation Services Handbook: The Role of the Financial Expert*, 6th Edition. Roman L. Weil, Daniel G. Lentz, and Elizabeth A. Evans, eds. Wiley, 2017, p. 4.15. I understand that Arizona’s contingency counsel will receive a significant share of any recovery.

conduct. I understand from counsel that Dr. Anindya Ghose, an expert for Google, expresses the opinion that users have heterogeneous preferences for location-based services, targeted advertising, and personalization. Moreover, according to Dr. Ghose, users benefit from location services, including location-based targeted advertising. As a matter of economics, the value of the benefits users obtain from (i) location-based services and (ii) targeted advertising based on location offset the economic loss (if any) arising from Google's purported misuse of this technology. The net effect, if negative, is the measure of restitution, properly computed. I write "if negative" because the inclusion of user benefits and accounting for differences in preferences across users may result in no economic loss (and therefore no restitution) because the economic benefits may be greater than the economic loss (which may be insubstantial or even nonexistent).¹⁶

21. Dr. Levy does not prove that the net effect of the accused conduct is harmful to any one user, much less all.

¹⁶ I have not undertaken a restitution analysis because I understand it is Arizona's burden to estimate damages caused by the accused conduct.

III. DR. LEVY'S DISGORGEMENT APPROACH DOES NOT MEASURE REVENUES OR PROFITS CAUSED BY THE ACCUSED CONDUCT AND THEREFORE DR. LEVY'S QUANTIFICATION CANNOT BE HELD TO A REASONABLE DEGREE OF CERTAINTY

22. I have been informed that disgorgement should be limited to Google's revenues or profits that are shown to be "causally connected" to the accused conduct.¹⁷ Dr. Levy acknowledges this requirement.¹⁸ Further, I understand from counsel that revenue is only relevant for disgorgement as an equitable remedy where profit is incalculable.

23. Failure to isolate revenues or profits that are causally connected to the accused conduct means that Dr. Levy overstates disgorgement. If permitted, this would result in a windfall to Arizona (and its contingency counsel) and over-deter Google; this, in turn, would impose consumer harm on Arizona residents through lower consumer welfare—precisely the opposite of Arizona's stated intention. Therefore, as a matter of economics, it is essential to prove a link (causal connection) between the accused conduct and resulting revenues or profits. Without this, any quantification of disgorgement cannot be held to a reasonable degree of certainty.

¹⁷ A.R.S. § 44-1528(A)(3) states that the court may make such orders or judgments as may be necessary to "[r]equire that any profits, gain, gross receipts or other benefit obtained by means of any practice in this article declared to be unlawful be disgorged and paid to the state for deposit in the consumer remediation subaccount of the consumer restitution and remediation revolving fund established by § 44-1531.02."

¹⁸ Dr. Levy states, "I am advised by counsel that a disgorgement calculation requires a reasonable approximation of the amounts causally connected to the violation." *See* Levy Report, p. 26. And in Section 6.B. titled "Identifying Revenue That Is Causally Connected," he writes, "[f]or my disgorgement calculations, I first set out to determine Google's revenue in Arizona that makes use of the consumer location information collected through the unlawful practices alleged by the State." *Id.*, p. 29.

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24. Assuming that a portion of advertising revenues or profits can be a basis for disgorgement and that total advertising revenues or profits in Arizona are capable of being determined,¹⁹ one can quantify disgorgement as follows:

- i. **Step 1:** Determine the portion of advertising revenues or profits that are causally connected to the accused conduct. I discuss this step in **Section A** below.
- ii. **Step 2:** Determine the share of consumers in Arizona who were exposed to the accused conduct through configurations of settings that are identified in the Complaint (e.g., having Web and App Activity enabled while having Location History disabled),²⁰ were misled by the accused conduct, and would have configured their settings differently if not misled by the accused conduct. I discuss this step in **Section B** below.
- iii. **Step 3:** Determine the costs that should be subtracted from revenues or operating profits to arrive at a disgorgement profit. I discuss this step in **Section C** below.

25. Additionally, I understand that, according to the ACFA, a deceptive act must be “in connection with the sale or advertisement of any merchandise,” or else it

¹⁹ I do not address Dr. Levy’s determination of total advertising revenue in Arizona. This does not mean that I agree with those calculations. This applies to other statements made in the Levy Report that I do not address explicitly.

²⁰ I use acronyms “WAA” for “Web and App Activity,” and “LH” for “Location History” in the balance of this report.

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does not satisfy the definition of a violation of the ACFA.²¹ Crucially, the Levy Report is silent on this threshold question, other than its assumption that 100 percent of the accused conduct meets the requirements (the “100 percent assumption”). As a matter of economics, the 100 percent assumption does not hold. Google does not sell many of its services or apps to consumers, and there is no price associated with downloading and using Google apps. I understand that, to the extent that Google collects location data that is not in connection with any sales or advertisements of merchandise, Google’s act, even if deceptive, does not trigger the ACFA.

26. Dr. Levy failed to quantify any of the elements described in the three steps above. He does not account for the accused conduct. He offers no basis for the proposition that the alleged deception is in connection with the sale or advertisement of merchandise. He does not isolate profits attributable to accused conduct. As a result, his disgorgement estimates are unreliable and should not be credited.

27. In subsection A, I detail the failure of Dr. Levy to demonstrate the requisite causal connection between the accused conduct and his measure of Google’s advertising revenues or profits. In subsection B, I detail the failure of Dr. Levy to address whether consumers in Arizona (i) were exposed to the accused conduct and, if so, (ii) were misled and, if so, (iii) would have selected different settings if not misled. In subsection C, I detail the failure of Dr. Levy to compute the incremental costs of generating revenue from the accused conduct.

²¹ A.R.S. § 44-1522(A). *See also* A.R.S. § 44-1521(5) for definitions of “sale” and “merchandise.”

- A. **Dr. Levy's estimate of Google's advertising revenues or profits subject to disgorgement is not causally connected to the accused conduct and is therefore unreliable**

28. A causal relationship between the accused conduct and Google's profits requires identifying the difference between (i) Google's actual advertising profits in the presence of the accused conduct and (ii) Google's profits that could have been generated using, exclusively, lawfully collected location data – essentially, what Google's ad profits would have been but for the accused conduct. Item (ii) is the counterfactual scenario in which no accused conduct occurs. The two key characteristics of the counterfactual necessary to compute potential disgorgement damages are (i) the absence of the accused conduct and (ii) the presence of any and all lawful conduct that was, or could have been, implemented in lieu of the accused conduct. Here, the “actual world” is the world in which Google obtained and monetized data collected both lawfully and employing the accused conduct. The counterfactual world is one in which Google obtains and uses only lawfully collected location data (including using methods that were not used in fact but could have been).

29. Dr. Levy does not specify or quantify the counterfactual scenario. If Dr. Levy had specified and quantified the counterfactual scenario, he surely would have acknowledged the fact that Google collects location data and other types of data from sources that are unaccused (i.e., not alleged to be unlawful) and reflected that those data could have (and should have) been included in an appropriate counterfactual

quantification.²² Because Dr. Levy does not quantify such a counterfactual scenario, he does not (and, indeed, is unable to) determine the portion of revenues or profits that are attributable to the accused conduct. Instead, he puts forth two disgorgement figures that he claims reflect Google's relevant revenues (though, in my opinion, they do not).

- i. First, he assumes that 95 percent of Google's advertising revenues arise from geotargeting.²³ He claims this 95 percent is subject to disgorgement.
- ii. Second, he assumes an allocation of Google's advertising revenues of [REDACTED] percent that he claims is "location driven" and is subject to disgorgement.²⁴

30. Because he makes no explicit specification of a counterfactual scenario, Dr. Levy effectively assumes, without basis, that the counterfactual is either one in which Google utilizes no location information from users for ad targeting and gets zero revenue from all ads that previously used some form of geotargeting (the Levy Report's 95 percent scenario) or one in which Google utilizes only country-level location information for ad targeting (the Levy Report's [REDACTED] scenario). Put differently, in his model he effectively rules out the option by Google, in the counterfactual, from optimizing profits

²² I discuss examples in Section III.A.2; sources of location data include IP addresses, user set home and work addresses, and search queries that reference location.

²³ Levy Report, p. 48 ("95% of [Google's] advertising revenue is a reasonable approximation of Google's geotargeted advertising revenue.").

²⁴ Levy Report, pp. 4-6, Section 2) "Summary of Findings and Opinions."

using the next-best lawful source of substitute data, such as, for example, selling the previously geotargeted ads without the location data at issue in this lawsuit. Dr. Levy's apportionment figures of 95 percent and [REDACTED] overstate disgorgement because they presume that Google would not have generated this revenue and profit, in the absence of the accused conduct.

31. As I describe in Section III.B.1, not all Arizona users of Google's products are implicated by the accused conduct, and therefore any revenues attributable to those products cannot be caused by the accused conduct. This notwithstanding, the Levy Report includes them in its quantification of disgorgement.

32. Because of the errors, omissions, and faulty assumptions in the Levy Report, the quantifications of disgorgement (i.e., the 95 percent scenario and the [REDACTED] scenario) cannot be held to a reasonable degree of certainty. Thus, they should not be credited.

33. In the two sub-subsections below, I explain why Dr. Levy's disgorgement estimate based on 95 percent of Google's advertising revenues is unreliable (sub-subsection 1) and why his disgorgement estimate based on [REDACTED] of Google's advertising revenues and operating income is unreliable (sub-subsection 2).

1. Dr. Levy's disgorgement estimate based on 95 percent of Google's advertising revenues and operating profits is not causally connected to the accused conduct and is grossly inflated

34. In his first set of damages calculations, Dr. Levy purports to calculate "the percentage of Google's ad revenue obtained in connection with the geotargeted

advertisements to be 95% of Google's advertising profits from serving advertisements in Arizona."²⁵ Dr. Levy arrives at his estimate by multiplying his estimate of Google's total advertising revenues and operating profits for advertisements served to Arizona users by 95 percent.²⁶ An award of Dr. Levy's disgorgement based on 95 percent of Google's revenues and operating income would lead to a windfall for Arizona because this disgorgement estimate includes Google's revenues and operating profit in Arizona that were generated through conduct unrelated to the claims in the case and therefore not subject to disgorgement. For this reason, in my opinion, Dr. Levy's disgorgement estimate based on 95 percent apportionment cannot be held to a reasonable degree of certainty. Thus, it should not be credited.

35. To arrive at his first disgorgement estimate, Dr. Levy relies on an internal document produced by Google, which states, "Location targeting is one of the most basic targeting features in Ads, more than 95% of Display revenue are from Advertisers with location targeting, more than [REDACTED] with below-country level targeting."²⁷ Dr. Levy's disgorgement calculation assumes that in the absence of Google's accused conduct, Google's advertising revenue and operating income would be 95 percent lower over the entire period from Q4 2013 to 2021. This estimate implicitly assumes a counterfactual

²⁵ Levy Report, p. 28.

²⁶ Levy Report, p. 40, Table 7.4, and p. 42, Table 7.5. Dr. Levy first calculates Google's revenue and operating income from serving advertisements in Arizona in each year from 2013 to 2021. Then, he applies an apportionment of 95 percent to the revenue and operating income calculated above, a percentage he claims to be "tied to geotargeting" in Google's overall advertising revenue.

²⁷ GOOG-GLAZ-00202413.R - GOOG-GLAZ-00202436.R at GOOG-GLAZ-00202414.R.

world in which 95 percent of Google's advertising revenue is "causally connected" to the accused conduct. Dr. Levy's assumption is incorrect.

36. Dr. Levy's disgorgement based on 95 percent of Google's advertising revenue suffers from a number of flawed underlying assumptions. These flaws include (i) Dr. Levy's assumption that any form of geotargeting by any means—including, for example, geotargeted ads using user-provided information such as search queries and confirmed home and work addresses, is accused conduct, (ii) Dr. Levy's assumption that Google would be unable to meaningfully geotarget without the location signals alleged to have been improperly obtained, (iii) Dr. Levy's assumption that Google could or would ignore country-level restrictions on advertising that necessitate geotargeting, (iv) Dr. Levy's assumption that other targeting criteria (such as keyword targeting) and products Google provides in Search, Display, video, and other products do not contribute to Google's advertising revenue and profit for advertisements that include some form of geotargeting, (v) Dr. Levy's assumption that Google's advertising revenue and profit from advertisements on third-party sites, which are governed by their respective disclosures and privacy policies, not Google's, are subject to disgorgement, and (vi) Dr. Levy's assumption that Google's advertising revenue or profit based on accused device-level settings for iOS devices, users who are signed out of their Google account, desktop users who are not exposed to certain settings in connection with the accused conduct, and others who would not be exposed to any of the accused conduct are subject to disgorgement. Dr. Levy offers no basis to treat any of these assumptions as valid. If all of these assumptions are proven to be outside the scope of the accused conduct, as Google

believes, then the Levy Report's disgorgement based on a 95 percent apportionment model overstates disgorgement on at least the six grounds enumerated in this paragraph and is all the more unreliable.

37. First, I understand the accused conduct does not broadly comprise all location data used in geotargeting of advertisements. A large amount of the location information used for Google's geotargeting ads is obtained from sources that are not in connection with accused conduct in this matter, including IP addresses, search queries, and confirmed home and work locations provided directly by users. From an economic perspective, if Google was unable to rely on location data obtained through accused conduct, Google would continue to generate advertising revenues and profits by serving advertisements that do not use data based on accused conduct.²⁸ In fact, Dr. Nielson, one of Arizona's experts in this matter, confirmed the need for IP addresses for "confirming country-level location for purposes of, for example, ensuring compliance with specific countries' laws when serving ads."²⁹

38. Dr. Levy's disgorgement estimate also fails to account for the many different characteristics of Google's advertising business that contribute to Google's revenues and profits, including for advertisements that also include some form of

²⁸ For example, an advertisement that targets at the postal zone level may be priced at \$2.00 per click. Without that level of geotargeting, Google can replace that advertisement with one that targets at the state level, using IP addresses alone, for \$1.90, a revenue loss of just \$0.10. Dr. Levy's calculation would not quantify this transaction at ten cents. Instead, he implicitly assumes that Google would not be able to generate any revenue if it no longer provides geotargeting at the postal zone level, thereby suffering a revenue loss of the entire \$2.00.

²⁹ Declaration of Seth Nielson, *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, November 16, 2021, ¶ 102.

geotargeting. Google's advertising business generates revenues and profits that are attributable to many factors, including the technologies Google has developed in Search, Display, video, and other advertising products, the audiences that use Google's products, and the operations and management of the products, among many others. Geotargeting is just one of the many features that contribute to Google's advertising revenue.³⁰ As a hypothetical example, if a third-party advertiser bid \$2.00 for a Display Ad about sneakers that was being served to someone who had visited websites about sneakers and also included some form of geolocation targeting, Dr. Levy assumes that third parties would pay \$0.00 for the same sneakers ad without the geolocation aspect. However, this completely ignores the many other aspects of a Display Ad that could result in the non-geolocation-targeted ad costing the same or a substantially similar price, say \$1.90, not \$0.00.

39. Google's products include Google Ads, which provides advertisers with access to audiences that use Google's various products. Through Google Ads, advertisers purchase advertising with Google to reach customers. Google's channels include:

- Google Search, which provides text ads on search results,

³⁰ Remote Videoconferenced and Videotaped Examination Under Oath of Google PMK Karen Hennessy, *In re Confidential Investigation Under the Arizona Consumer Fraud Act*, Investigation No. CLU-INV-2019-0097, May 21, 2020 ("Hennessy EUO"), pp. 35-36 ("[T]he features within the products do support things like geotargeting as well as other types of audience targeting as well as optimization, the ability to set bids and prices. There really isn't a differentiated value to individual features in the way that you're describing. So I don't think it would be accurate to characterize location as a way that Google is monetizing.").

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- Google's Display Network, which provides image ads on websites,
- Google Video, which provides video ads on YouTube,
- Google Shopping, which provides product listings on the Google Shopping tab,
- App, which provides app-promotions through a variety of the other channels, and
- Local campaigns, which help advertisers promote physical stores and venues.³¹
- Google also offers access to a product that advertisers can use to run advertisements across all of the other channels.³²

40. Advertising campaigns involve one or more of these channels, each of which relies on user location to varying degrees, if at all, depending on users' interactions with the products. For example, advertisers who create a Google Search campaign can target audiences using:

- Keywords used in Google search, which is by far the most influential input,
- Information about what users care about, which Google calls "affinity,"
- Demographic characteristics,
- Recent purchase intent,

³¹ Google, "Choose the right campaign type," available at <https://support.google.com/google-ads/answer/2567043>.

³² *Id.*

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- Users who have visited the advertiser's website and/or apps,
- Information from the advertiser's CRM data,
- Location at varying levels of granularity, subject to constraints (discussed below), for physical location or areas of interest,³³ and
- Based on other users with interests similar to the advertiser's website visitors or existing customers.³⁴

41. The location signals used for geotargeting also vary across ad products, another fact not accounted for by Dr. Levy. For example, I understand that Search Ads uses the [REDACTED] service, which may consume data from sources such as WAA and LH, whereas Display and Video Ads have not historically relied on [REDACTED], but instead on IP-derived location.³⁵ Profits attributable to the accused conduct related to WAA would not be consistent across ad products. Moreover, Dr. Levy's 95 percent figure is taken from a document referring to the percentage of Display Ads that include some form of geotargeting. However, Display Ads do not rely on location data obtained as a result of the accused conduct; they rely on IP-derived location information that is made publicly available from the user's device and is otherwise available through third parties. Thus,

³³ Google, "Location targeting," available at <https://support.google.com/google-ads/answer/6317>.

³⁴ Google, "About audience targeting," available at <https://support.google.com/google-ads/answer/2497941>.

³⁵ Based on my conversation with Karin Hennessy.

Dr. Levy's calculation based on this figure is unreliable and would result in zero disgorgement.

42. Similarly, the accused acts are also differently situated with respect to their relationship to advertising. For instance, a principal claim is that Google misleads users by collecting location data in WAA when users disable LH. However, I understand that the Google Ad Personalization ("GAP") setting controls whether location data in WAA can be considered in determining a location that could be used for advertising, meaning that such data saved in WAA would be irrelevant to Google's advertising revenue for the class of users that disabled GAP.³⁶ Another claim is that Google misleads users about how quickly it deletes location data, but I understand that Google stops using a user's deleted location data for any purpose (including advertisements) immediately upon deletion.

43. Across ad products, with respect to use of location data in advertising, the "3+1 rule" aggregates users into geographic areas, which enhances privacy protections. Transforming granular location into a geographic area by way of the "3+1 rule" is known as "coarsening." In this regard, Karin Hennessy testified in her EUO:

Q: So how precise, then, would that location targeting area be?

A: Right. So the source of the data from the device around location always resolves to what we effectively call a city standard for a coarsened location. You might hear that term or see that term. And that means that the location that is associated with that request or that user is always a minimum of 3 kilometers geographic area plus a

³⁶ Based on my conversation with Karin Hennessy.

minimum of 1,000 users in density [...] there is no way for an advertiser to specifically narrow down to something below the city standard. It's always effectively a blob that is overlaid or larger that meets those standards that they're able to reach.³⁷

44. According to Pallavi Anderson, a software engineer at Google for Search Ads, approximately [REDACTED] of Google Search's advertising revenue is targeted at a country level, and another [REDACTED] is at a state level.³⁸ For "privacy safe" locations, advertisers can generally target at city or postal code levels so long as the 3+1 rule is satisfied.³⁹

45. For instance, in the Google Display Network,⁴⁰ two main types of targeting are interest targeting and demographics targeting.⁴¹ Interest targeting describes focusing on individuals who have expressed specific interests or hobbies or are looking for products similar to the ones the advertiser is selling. For example, if a user visits a webpage about sneakers, the Google Display Network could show that user an advertisement about sneakers. Different customers can also be targeted or excluded based on demographics such as age, gender, parental status, and others. These two types

³⁷ Hennessy EUO, pp. 67, 70-71.

³⁸ Videotaped Zoom Deposition of Pallavi Anderson, *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, March 7, 2022 ("Anderson Deposition"), pp. 9-10.

³⁹ Anderson Deposition, p. 10. I understand there are isolated exceptions involving sparsely populated areas, to which the "privacy safe" policy does not always apply.

⁴⁰ Google, "About Display ads and the Google Display Network," available at <https://support.google.com/google-ads/answer/2404190>.

⁴¹ Google, "Reach a larger or new audience with Google Display Network targeting," available at https://ads.google.com/intl/en_id/home/resources/reach-larger-new-audiences/.

of targeting can be combined if the advertiser chooses. These non-geotargeting features are a significant part of Google Display Network in attracting advertisers and generating advertising revenue. I understand that Google Display Network includes ads on third-party sites or apps based on location data from third-party sites and apps, which Google discloses in its Privacy Policy and which I understand is not accused conduct.⁴²

46. Dr. Levy has confused the inclusion of geotargeting in advertisements with the contribution to revenues and profits of the accused conduct. Location targeting is a standard feature among many targeting characteristics for Google Search campaigns. Pallavi Anderson testified, "there are many other filters and checks in the ads that we flow. Location isn't the only determinant of whether an ad will match or not match."⁴³ Furthermore, advertisers are not charged an additional fee for the geotargeting aspects of advertisements, as "it is a standard feature [...] of the platforms."⁴⁴ At the most fundamental level, Google's proprietary optimization technology allows advertisers to target users who use certain search terms, which is a fundamental part of Google's Search product.⁴⁵ Google Search provides a tool for users to access information quickly and

⁴² Google's Privacy Policy states, "the activity information we collect may include [...] [a]ctivity on third-party sites and apps that use our services." See Google, "Google Privacy Policy," available at <https://policies.google.com/privacy>.

⁴³ Anderson Deposition, p. 11.

⁴⁴ Hennessy EUO, p. 29.

⁴⁵ Google's Support Page states, "People can show interest through terms used in their searches, if they were recently in a location, or through content they view related to the location (such as pages or sites)." See Google, "About advanced location options," available at <https://support.google.com/google-ads/answer/1722038>.

reliably.⁴⁶ When users of Google enter a search term, the keywords that advertisers' select are used to provide search ads that are relevant to that user's search.⁴⁷ User engagement with targeted ads can provide value to advertisers, and value to Google in return.

47. As an example showing that geotargeting is not equivalent to the accused conduct, Google users could have received geotargeted ads based on data about their home address that they added to their Google Account. Users located in the U.S., for example, may receive ads geotargeted based on this self-reported information like a query location (e.g., "ramen in San Diego"), which I understand is not accused conduct. In fact, Arizona acknowledges that Google may be required to attempt to get country-level user information for complying with the laws in countries around the world, as discussed above.

48. Thus, the Levy Report's disgorgement estimate based on 95 percent of Google's advertising revenue is not "causally connected" to the accused conduct. This measure of disgorgement fails to conform to a fundamental principle that disgorgement amounts be "causally connected to the violation," as stated in the Levy Report.⁴⁸ Any valid disgorgement estimate must demonstrate the link between the accused conduct

⁴⁶ Danny Sullivan, "How Google delivers reliable information in Search," September 10, 2020, available at <https://blog.google/products/search/how-google-delivers-reliable-information-search/>.

⁴⁷ Google, "About the Google Search Network," available at <https://support.google.com/google-ads/answer/1722047>.

⁴⁸ Levy Report, p. 26 ("I am advised by counsel that a disgorgement calculation requires a reasonable approximation of the amounts causally connected to the violation."). *See also* Levy Report, p. 29, "Identifying Revenue That Is Causally Connected."

with the attendant harm; the Levy Report does not do so. Indeed, there is no discussion at all of how the conduct alleged in paragraph 161 of the Complaint relates in any way to 95 percent of Google's revenue. The extent to which the Levy Report's quantification of disgorgement is not causally connected to the accused conduct confers a windfall to Arizona. Because the Levy Report neither demonstrates causation nor provides an alternative basis for believing causation exists, in combination with the plethora of unaccused factors that select advertising to users, I believe that Dr. Levy's disgorgement based on 95 percent of Google's advertising revenue cannot be held to a reasonable degree of certainty. Thus, it should not be credited.

2. Dr. Levy's disgorgement estimate based on [REDACTED] of Google's advertising revenues and operating income fails to isolate Google's revenues or profits that are causally connected to the accused conduct, and is inflated

49. In his second quantification of disgorgement, which he posits in the alternative, Dr. Levy purports to "calculate an apportionment considering information and calculations produced internally at Google as to the amount of advertising revenue that is specifically driven by geo-targeting."⁴⁹ Dr. Levy arrives at his estimate by multiplying Google's total advertising revenue and operating income for advertisements served to Arizona users by [REDACTED].⁵⁰ Dr. Levy's disgorgement based on [REDACTED] of Google's revenues and operating income is not causally connected to the accused conduct and therefore cannot be reliably used to inform the magnitude of

⁴⁹ Levy Report, p. 28.

⁵⁰ Levy Report, p. 40, Table 7.4, and p. 42, Table 7.5.

disgorgement. For this reason, in my opinion, Dr. Levy's disgorgement estimate cannot be held to a reasonable degree of certainty. Thus, it should not be credited.

50. To arrive at his estimation, Dr. Levy relies on an internal document produced by Google which contains a chain of emails. These emails describe the results of a location ablation study conducted by the User Location team to determine the value of certain location targeting data on Google's advertising revenue.⁵¹ Specifically, an email from Ankit Gupta, dated August 2, 2017, states that [REDACTED]

[REDACTED].⁵² Dr. Levy calculates the aforementioned [REDACTED] as the weighted average of [REDACTED] of the advertising revenue for Search Ads and [REDACTED] of the advertising revenue for Display Ads. From this, he concludes (improperly in my opinion) that [REDACTED] of Google's advertising revenue is "driven by location data."⁵³

51. While he fails to specify a counterfactual scenario in his report, Dr. Levy implicitly assumes a counterfactual in which [REDACTED] of Google's advertising revenue is causally connected to the accused conduct. Put differently, Dr. Levy's quantification of disgorgement (based on the [REDACTED] input) effectively prohibits Google from adjusting its business practices, and data acquisition and monetization, in the counterfactual scenario (i.e., no accused conduct), and it incorrectly assumes that

⁵¹ GOOG-GLAZ-00232189 - GOOG-GLAZ-00232190.

⁵² GOOG-GLAZ-00232189 - GOOG-GLAZ-00232190 at GOOG-GLAZ-00232190.

⁵³ Levy Report, p. 4.

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Google would not have obtained any portion of the “location” data accounted for in the location study had it not engaged in the accused conduct. In addition, Dr. Levy imposes these constraints on Google’s freedom to optimize for the entire duration of the accused conduct (Q4 2013 through 2021). These constraints are neither justified by Dr. Levy nor justifiable as a matter of economics.

52. An example of why these limitations on Google’s freedom of action are economically unjustifiable can be seen by way of a stylized example as follows. Suppose a company manufactures specialty widgets and generates \$100 in profits. It does so using a proprietary process, instead of a well-known (and unprotected) legacy process. Suppose further that the company is not permitted to use the proprietary process and must “disgorge its ill-gotten profits.” In the Levy Report’s formulation, this would be \$100. However, \$100 may be the profits, but they are not the ill-gotten profits. The ill-gotten profits are the incremental profits generated by employing the proprietary process instead of the legacy process. There is nothing stopping this company from using a legacy process. If the legacy process costs \$10 more than the proprietary process, then the ill-gotten gain is, simply, \$10. That \$10 is the amount of additional profits generated by moving from the legacy process to the proprietary process in this example. Dr. Levy does not perform this analysis in his calculations.

53. Dr. Levy’s use of Google’s location ablation study as an input to a disgorgement remedy requires assessment of the applicability of the results of the study as an appropriate measure of Google’s revenues or profits “causally connected” to the accused conduct in this matter for the period Q4 2013 to 2021. The document he cites does

not contain a description of the specific ablation undertaken or other methodologies used. For example, the document does not indicate whether the population sampled included Arizona users, U.S. users, or worldwide Google users. (I understand this study is based on a sample of global users, not just users from the U.S. or Arizona.⁵⁴) The Levy Report does not assess the applicability of an ablation study based on global users to U.S. or Arizona populations. The document also does not provide an explanation or other relevant data to validate the [REDACTED] or [REDACTED] impact on Search Ads and Display Ads, respectively. In my opinion, Dr. Levy has not conducted the appropriate assessment of the study upon which he relies to determine Google's revenues or profits that are "causally connected" to the accused conduct in this matter. In fact, I understand that this is a one-off study conducted by Google to understand the impact of location information at the sub-country level at a certain point in time, which consisted of just a few days to at most a week.⁵⁵ Moreover, this study was conducted on Search Ads exclusively, not Display Ads.⁵⁶ Therefore, it is unclear what the [REDACTED] revenue impact measures, how it was estimated, and whether it is applicable to the accused conduct in this matter.

54. I have assessed the applicability of the study upon which Dr. Levy relies; I conclude that it is not applicable as used in the Levy Report—in particular, because it is

⁵⁴ Based on my conversation with Ingemar Eriksson, one of the authors of this ablation study. See GOOG-GLAZ-00248726 - GOOG-GLAZ-00248727.

⁵⁵ *Id.*

⁵⁶ *Id.*

inconsistent with a properly specified counterfactual scenario. For the Levy Report's results to be reliable, Google's revenues or profits that are "driven" by location data, as the study concludes, must be equivalent to Google's revenues or profits that are "causally connected" to the accused conduct. But "driven by" and "causally connected" are not equivalent. Dr. Levy's estimated revenues in the counterfactual scenario includes revenues and operating income both from Google's conduct that is not challenged and conduct that is accused.

55. The goal of the Google study upon which Dr. Levy relies was to provide "an update on the work the User Location team has done in the last few quarters and the effect it has had on Google's Advertising Revenue."⁵⁷ The study was conducted as a one-off experiment. The study involves an [REDACTED]

[REDACTED]

[REDACTED]⁵⁸ Further, I understand that by [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]⁵⁹

56. It is inapt to compare Google's advertising revenue based on location data as typically utilized in targeting with its revenue derived from targeting using country-level location information. A properly defined counterfactual scenario should include

⁵⁷ GOOG-GLAZ-00232189 - GOOG-GLAZ-00232190 at GOOG-GLAZ-00232189.

⁵⁸ GOOG-GLAZ-00248726 - GOOG-GLAZ-00248727 at GOOG-GLAZ-00248726.

⁵⁹ *Id.*

location data at a more granular level than at the country level. This is because Google maintained location data through other means that are not alleged to be unlawful conduct (for example, user-provided home and work data, device location from iOS devices for which Google had no involvement in the design of settings and permissions, and locations users provide in the queries).⁶⁰ In the counterfactual world, Google could have still incorporated those lawful methods of location data collection.⁶¹

57. Google obtains user location derived from publicly available user IP addresses. I understand that devices that are connected to the internet each have an Internet Protocol (IP) address that is assigned to the device by the internet service providers, which include cable, phone, and wireless providers. By visiting a website or using an app, the user's device IP address communicates with a server to facilitate the bidirectional flow of information and services.⁶² Through long-standing and publicly available data about the location of various internet service providers, the user's device location can be approximated using the IP address to a city or more granular level.⁶³ Google has collected location data based on IP addresses since 2010 or before.⁶⁴ In the

⁶⁰ Google, "Set or change your home & work addresses," available at <https://support.google.com/maps/answer/3093979>.

⁶¹ When Google conducted [REDACTED] in 2021, for example, [REDACTED]. See GOOG-GLAZ-00252658 - GOOG-GLAZ-00252686 at GOOG-GLAZ-00252661. This objectively shows that Google would still obtain location information in any appropriate counterfactual scenario.

⁶² Eric Griffith, "How to Find Your IP Address," March 7, 2021, available at <https://www.pcmag.com/how-to/how-to-find-your-ip-address>.

⁶³ *Id.*

⁶⁴ GOOG-GLAZ-00248726 - GOOG-GLAZ-00248727 at GOOG-GLAZ-00248727.

counterfactual world, Google would continue to collect location data using IP addresses. This information would provide lawfully gained information for Google's location targeting features in its advertising services. However, Dr. Levy failed to account for these alternative sources of data in his counterfactual when relying on the location study that ablated location data derived from both accused conduct and unaccused conduct

[REDACTED]

58. Google also has used and could continue to use IP geolocation data vendors, including, for example, Neustar.⁶⁵ The databases used for geolocation are available for free or through subscription services. Some of the data in geolocation databases is contributed by internet service providers or are gathered by the vendor. The data from geolocation databases is pervasive, used by internet-based services.⁶⁶ Commercial vendors use a variety of public and purchasable information, including WhoIs data, the Border Gateway Protocol ("BGP") data, e-commerce originated location

⁶⁵ Video-Recorded Remote Deposition of Ingemar Eriksson, Volume 2, *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, October 5, 2021, p. 312 ("Q: Do you know whether 2009 is approximately when Google started predicting user location from IP addresses for purposes of serving Ads? [...] A: I believe before around this time the IP to location map was purchased from [...] a company called Quova that was acquired by Neustar"). Other common IP geolocation service vendors include IP2Location ("IP Geolocation Data Accuracy," available at <https://www.ip2location.com/data-accuracy>), Geo Targetly ("Location Accuracy," available at <https://help.geotargetly.com/en/articles/1238962-location-accuracy>), and GeoIP2 by MaxMind ("Geolocation Accuracy," available at <https://support.maxmind.com/hc/en-us/articles/4407630607131-Geolocation-Accuracy>).

⁶⁶ See, e.g., WhatIsMyIPAddress, "Geolocation Database Providers," available at <https://whatismyipaddress.com/geolocation-providers> ("IP Geolocation Database by WhoisXML API is a downloadable database that contains the geolocation data of +99.5% of active IPv4 and IPv6 addresses.").

data, and IoT devices with known locations and IP addresses, to estimate a user's location.⁶⁷ I understand the Neustar IP geolocation product uses users' IP address, which uniquely identifies each computer or device connected to the internet and is publicly available. IP geolocation providers such as Neustar can then provide users' physical location at the zip code, city, state, or country level based on the unique IP address assigned to each device. Specifically, Neustar claims that it "only stores IP geolocation data at the zip code level or higher" (e.g., city, state, or country level) and that it "do[es] not have information about a person, nor an email address or a street address."⁶⁸ I understand third-party IP geolocation services provide location information of similar granularity as the data collected by IPGeo.⁶⁹ Moreover, due to the "3+1" rule, Google may limit the granularity of the location data more than third-party IP geolocation services do. In such cases, some third-party IP geolocation services may be able to provide location data that would be similar to (or in many instances even more precise than) the location data currently used for geotargeting.⁷⁰ Neither Dr. Levy, nor any other witness or document with which I am familiar, quantifies the incremental profit to Google from increasingly refined location data. It would be reasonable to expect that Google would not be worse off from an ads revenue perspective if it used third-party IP geolocation

⁶⁷ Pol Nisenblat, "IP Geolocation Demystified," February 26, 2020, available at <https://www.bigdatacloud.com/blog/ip-geolocation-demystified>.

⁶⁸ Neustar, "Neustar IP Intelligence FAQ," available at <https://www.home.neustar/resources/faqs/ip-intelligence>.

⁶⁹ Based on my conversation with Ingemar Eriksson.

⁷⁰ *Id.*

data instead of IPGeo data. That is because at the time ads are served, IPGeo relies upon IP addresses, meaning that for purposes of impacting ads revenue, it is likely equivalent to a third-party IP geolocation provider. Google's own review of the value of capturing user location confirms that [REDACTED]

[REDACTED]

[REDACTED]⁷¹

59. Google discloses to users that IP address is a signal to obtain location information.⁷² Google's "Privacy and Terms: Privacy Policy" page discloses that Google collects information, including IP address, and that the user's "location can be determined with varying degrees of accuracy by [...] IP address," among other signals.⁷³ The Privacy Policy also discloses categories of information that Google collects, including "[g]eolocation data, such as may be determined by GPS, IP address, and other data from sensors on or around your device, depending in part on your device and account settings."⁷⁴ The page also links to a separate page titled, "Privacy and Terms: Technologies," which discloses Google's use of the "IP address from your Internet connection," including the use of the IP address for location services:

⁷¹ GOOG-GLAZ-00248682 - GOOG-GLAZ-00248685 at GOOG-GLAZ-00248684.

⁷² Google, "Google Privacy Policy," available at <https://policies.google.com/privacy>.

⁷³ Google, "Google Privacy Policy," available at <https://policies.google.com/privacy>. I understand that Google has at all times relevant to the Levy report included in its Privacy & Terms a disclosure that "IP address can often be used to identify the location from which a device is connecting to the Internet." See Google, "IP address," available at <https://policies.google.com/privacy/key-terms#toc-terms-ip> (linked in the current Privacy Policy referenced above).

⁷⁴ Google, "Google Privacy Policy," available at <https://policies.google.com/privacy>.

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An IP address (also called Internet address) is assigned to your device by your Internet Service Provider, and is a requirement to use the internet. IP addresses are used to make the connection between your device and the websites and services you use. IP addresses are roughly based on geography. This means that any website you use, including google.com, may get some information about your general area.

Like many other internet services, Google can use information about the general area that you're in to provide some basic services. Estimating the general area that you're in means for instance that Google can give you relevant results, and keep your account safe by detecting unusual activity, such as signing in from a new city.⁷⁵

60. Google also discloses use of IP addresses to gain location on Search pages for some devices. For example, searches conducted on a desktop or laptop computer include a disclosure that provides the user's zip code, city, and state, "From your IP address - Update location." Google discloses its use of the user's IP address for geolocation. I understand that Arizona does not claim that Google fails to disclose its use of IP addresses for geolocation.

61. In addition to use of IP addresses for geotargeting, Google could also utilize other user location data that is not alleged to be gathered unlawfully but was ablated as part of the location study that Dr. Levy relies on. For instance, Google discloses in its Privacy Policy to users the use of "[a]ctivity on Google services, such as your searches and places you label like home or work" as one signal to obtain location information.⁷⁶ Additionally, some users provide their location information, including home and work

⁷⁵ Google, "Google Privacy & Terms, Technologies," available at <https://policies.google.com/technologies/location-data>.

⁷⁶ Google, "Google Privacy Policy," available at <https://policies.google.com/privacy>.

locations, in their account page. I understand from counsel that these sources of location data are not accused conduct.

62. Further, it is inappropriate to apply the results of a one-time short-run study that measures the effect of an ablation over a matter of days or weeks to estimate the impact over a period of years. Because Google undertook these studies for an entirely different purpose (i.e., not to assess the economics of this litigation), many of the results do not align with the timeline and accused conduct in this proceeding.

63. The Levy Report fails to demonstrate that it is appropriate to apply the [REDACTED] estimate (which is derived from an ablation study covering a short period of time) to the entire eight-year period of his disgorgement calculation (Q4 2013-2021). Because of significant changes in technology and consumer behavior over time, including the dramatic uptake in smartphone adoption, Dr. Levy's application of an estimate based on behaviors in 2018 introduces another source of error in his quantification of disgorgement. This is because behaviors in 2018 may not describe behaviors in Q4 2013, for example (and may not accurately predict behavior in 2021). The failure to consider data from other intervals of time during this eight-year period further undermines the reliability of his disgorgement estimate, given that such data exists in the record and the document Dr. Levy relies upon discusses how a series of location-related launches have

impacted revenue over time.⁷⁷ Just as notable is Dr. Levy's failure to account for major changes in the use of location post-dating the 2018 study, such as the further coarsening of location data used for geotargeting in April 2019, which may have impacted Google's revenues.⁷⁸

64. I understand the temporary nature of the ablation experiments reflects the fact that the studies were designed to investigate and understand the effect at that moment in time.⁷⁹ I understand there are dynamic aspects of advertising, in which users and advertisers change their behaviors over time depending on their needs and options.⁸⁰ For instance, if users' locations were an important aspect to search queries, users may opt to provide more specific information about their current locations when they type in search queries to receive more relevant results. For example, if location data were no longer used to inform searches (e.g., in the counterfactual), a user, after learning that, may type in a more precise search to help return more relevant information. Indeed, as stated above, recent ablations of device location showed large increases in users seeking to

⁷⁷ As just a few examples, Google conducted location ablations in 2021 (GOOG-GLAZ-00252658 - GOOG-GLAZ-00252686) and 2019 (GOOG-GLAZ-00312969 - GOOG-GLAZ-00312974), and conducted a study ablating personalization signals in 2019 (GOOG-GLAZ-00313605 - GOOG-GLAZ-00313610). Notably, these more recent ablations found far more modest impacts on revenue than the [REDACTED] Dr. Levy relies upon from the single 2018 ablation. In fact, the ablations show a decreasing impact on revenue from the ablation of certain location signals. The 2019 ablation showed [REDACTED] whereas the 2021 study showed [REDACTED]

⁷⁸ GOOG-GLAZ-00245426.

⁷⁹ Based on my conversations with Pallavi Anderson and Ingemar Eriksson.

⁸⁰ Based on my conversations with Pallavi Anderson and Ingemar Eriksson.

improve location.⁸¹ At the same time, advertisers may adapt their advertising strategies to the types of geotargeting that Google provides. For example, if certain types of geotargeting were no longer offered by Google, advertisers may elect to use different geotargeting options or no geotargeting options, as opposed to not using Google ads altogether. Additionally, the auction model used for Google's advertising business may also change over time as a reflection of changes in user and advertiser behaviors. However, the location ablation study on which the Levy Report bases its conclusion did not factor in any of these effects. Consequently, this study cannot be used to reliably measure the economics of this litigation. These dynamics suggest that the Levy Report's use of the ablation study results to calculate a long-term impact on Google's advertising revenue over eight years misapplies the study's results.

65. Dr. Levy also failed to consider whether the loss of more accurate or precise location may have secondary effects that increase Google's revenue. For example, "auction density" (the number of competitive ads that are eligible to participate in an ad auction) can increase Google's revenues. Google's internal documents show that

[REDACTED]

[REDACTED]⁸² Therefore, the inability of advertisers to geotarget more granular locations may have a positive impact on Google's revenues, stemming from [REDACTED], though users

⁸¹ Based on my conversation with Pallavi Anderson.

⁸² GOOG-GLAZ-00251597 - GOOG-GLAZ-00251600 at GOOG-GLAZ-00251598.

would likely experience lower-quality advertisements.⁸³ Similarly, Google's studies have shown that more accurate locations may decrease revenue, by moving users out of locations with higher auction density (such as a city center) to areas with lower auction density (such as suburbs). The Levy Report does not address any of these forces and, therefore, does not include them as an offset to disgorgement. This further undermines the reliability of the quantification of disgorgement set forth in the Levy Report.

66. A proper measurement of disgorgement would be to determine the difference between (i) Google's advertising revenues or profits that Google actually generated and (ii) the advertising revenues or profits Google could have generated using location and other data from lawful sources. This difference reflects Google's revenues (or profits) that are causally connected to the accused conduct.

67. Although it is not equivalent to a counterfactual world for several reasons, a closer approximation is an experiment that at least features some characteristics similar to a properly constructed counterfactual world. In August 2018, [REDACTED]

[REDACTED]

[REDACTED]⁸⁴ Specifically, [REDACTED]

[REDACTED]

[REDACTED].⁸⁵

⁸³ *Id.*

⁸⁴ GOOG-GLAZ-00313605 - GOOG-GLAZ-00313610.

⁸⁵ *Id.* at GOOG-GLAZ-00313606.

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68. According to the Google document, the goal of the study is to [REDACTED]

[REDACTED].⁸⁶ I understand that in this experiment, [REDACTED]

[REDACTED].⁸⁷ Device Location was still available to Google for those users who had granted permission to Google.⁸⁸ I further understand that certain types of personalized location data ablated in this study, such as user-provided home/work addresses, search term history, and data from those who wanted to have LH or WAA enabled, are not alleged to be unlawful in this matter.

69. During the week of [REDACTED]

[REDACTED] Pallavi Anderson testified that the metric

⁸⁶ *Id.* at GOOG-GLAZ-00313605.

⁸⁷ Based on my conversation with Pallavi Anderson, one of the authors of the study, I understand that Google (i) gathers precise location data from users who have enabled their Device Location, (ii) uses the data in service of a particular request, but (iii) retains the data in a coarsened state (i.e., in compliance with the “3+1” rule).

⁸⁸ Based on my conversation with Ingemar Eriksson, Device Location always requires user permission. If a user turns Device Location off, Google is unable to collect precise location information through other means, [REDACTED]

[REDACTED] At serve time, IPGeo uses IP addresses alone for geographic information. Accordingly, this study attempted to [REDACTED]

[REDACTED] I understand that Arizona has not alleged that users did not know that turning device location on would make precise location available. Additionally, Arizona does not accuse conduct relating to device location for users of iOS devices.

is the “difference in what advertisers would be charged for every 1,000 queries in the experiment arm relative to the base, the control, and not with regard to any other thing.”⁸⁹

These results indicate that [REDACTED]

[REDACTED]⁹⁰ Additionally, not all personalized location data ablated in this study are obtained through the accused conduct and, therefore, should be excluded from the quantification of disgorgement.⁹¹ The Levy Report fails to exclude this source of revenue and profits.

70. With respect to Google Display advertising revenue, I understand that IP address is the primary source of location data used for geotargeting display ads.⁹² Based on this understanding, the location signals used for geotargeting Google Search Ads, including [REDACTED] and [REDACTED], are not used for geotargeting for Google Display ads. Therefore, the impact of ablating personalized location data, [REDACTED]

[REDACTED]

[REDACTED] There would be no difference between

⁸⁹ Anderson Deposition, pp. 73-74. Based on my conversation with Pallavi Anderson, I understand the study was conducted on [REDACTED]

⁹⁰ GOOG-GLAZ-00313605 - GOOG-GLAZ-00313610 at GOOG-GLAZ-00313606.

⁹¹ I understand from my discussion with Pallavi Anderson that this ablation study [REDACTED]

[REDACTED] See GOOG-GLAZ-00252658 - GOOG-GLAZ-00252686 at GOOG-GLAZ-00252667.

⁹² Based on my conversation with Karin Hennessy.

Google's Display advertising revenue in the actual scenario and the counterfactual scenario in which IPGeo data are used for users who have disabled their Device Location setting.⁹³

71. Dr. Levy's estimate for disgorgement, based on [REDACTED] of Google's advertising revenues and operating income in Arizona, overstates the remedy. This is because his quantification includes revenues or profits that are not causally connected to the accused conduct. An estimate of [REDACTED] of Google's Search advertising revenues would be a starting point for approximating disgorgement for Search Ads attributable to the accused conduct. Google's Display advertising revenues would not be affected by removing location data obtained from the accused conduct. If one assumes (i) a [REDACTED] revenue loss (as reported in the ablation study), and (ii) Dr. Levy's estimate of [REDACTED] in Google's operating income between Q4 2013 and 2021, the operating profit subject to disgorgement is [REDACTED].⁹⁴ But even that would be merely the first step, and additional steps would be needed to account for the short-term duration of the study relative to the period of eight years to which the results would need to be applied, and for the fact that the Google estimate of [REDACTED] is based on a world-wide sample that ablated more "location data" than was obtained through the accused conduct. Additionally, evidence of the share of users in Arizona who are exposed to the accused

⁹³ Based on my conversation with Karin Hennessy, I understand that Google gathers precise location data from users who have enabled their Device Location, and that the location data are then saved and used in a coarsened fashion in compliance with the "3+1" rule.

⁹⁴ [REDACTED] operating income is computed as [REDACTED] multiplied by [REDACTED] percent. [REDACTED] is Google's Arizona advertising operating income from Q4 2013 to 2021 (based on Levy Report, Table 7.5).

conduct, and the smaller share of those who had their WAA enabled and were misled, and the smaller share of those who had their WAA enabled and would have behaved differently if Google had not engaged in the accused conduct must also be taken into account. I discuss those steps next.

B. Neither Dr. Levy nor anyone he references has addressed whether consumers in Arizona (i) were exposed to the accused conduct and, if so, (ii) were misled and, if so, (iii) would have selected different settings if not misled

72. In this section, I describe the assumptions in the Levy Report that all users in Arizona (i) were exposed to the accused conduct, (ii) were misled by the accused conduct, and (iii) would have selected different settings if not misled.⁹⁵ The Levy Report provides no basis for these assumptions. I understand that evidence in this matter suggests that fewer than 100 percent of Arizona users (i) were exposed to the accused conduct, and (ii) if exposed, were misled, and (iii) if misled, would have different settings

⁹⁵ In particular, (iii) refers to Arizona users who would have elected into different location-based settings in the absence of the accused conduct once they understood the loss of beneficial services that are connected to the accused conduct. Further, to the extent Google's disclosures were confusing or misleading, users could have been misled in ways that were not financially advantageous for Google. For example, Arizona contends that users were misled into believing that their Wi-Fi setting has nothing to do with location. A user so misled may have kept the setting enabled if they had known it could improve location accuracy. In other examples, even if one assumes certain users were misled and would have made different choices, there is no proof that Google's revenue would have declined. For example, Arizona contends that Google unlawfully uses IP addresses to generate "coarse" locations for users when they turn off device location. Users who keep device location on may be unaware of that fact, but are still voluntarily providing Google with more accurate and precise device location. This illustrates why Dr. Levy's failure to account for reliance among users and the differences among the accused settings and technologies make his calculations unreliable.

in the absence of the accused conduct. Based on this evidence, the Levy Report overestimates the magnitude of disgorgement.

1. *Dr. Levy does not address that some users in Arizona were not exposed to the accused conduct*

73. Dr. Levy has not reported the frequency and breadth of exposure to various configurations of Google's location-related settings over time. Instead, he assumes all users are subject to all of the accused conduct across the entire time period, Q4 2013-2021. This is implausible for multiple reasons. For example, I understand there are settings that do not constitute the accused conduct, as I discuss further below. Additionally, Google's settings and disclosures, which inform the quantification of disgorgement in the Levy Report, also have changed over the years, and users may change their location settings over time. Nonetheless, the Levy Report does not account for these changes over the time. Indeed, the Levy Report simply assumes that, despite the reality of Google's location-related settings, every Arizona consumer is exposed to all the accused conduct for the entire eight-year time period. Nothing in the Levy Report provides a basis for this assumption. Further, the Levy Report does not address each configuration of accused conduct individually for the incidence of exposure.⁹⁶ If the incidence of exposure is less than 100 percent, then his disgorgement damages are inflated and therefore unreliable.⁹⁷

⁹⁶ Nor does the Levy Report classify the configurations into categories and address them in groups at a time.

⁹⁷ Since the Levy Report presumes 100 percent exposure, it is impossible to understate this element of disgorgement, but it takes only a few percentage points of overstatement to materially overstate disgorgement.

At the limit, if no one in Arizona was ever exposed to the accused conduct (e.g., never sought out an allegedly misleading disclosure, and/or did not notice the allegedly incorrect statement, and/or did not rely upon the allegedly incorrect statement despite noticing it), then Google's accused conduct deceived no one in Arizona and there would be no allegedly ill-gotten gains to disgorge—in direct contradiction to a fundamental presumption in the Levy Report.

74. I understand from counsel that there are settings or configurations that do not constitute the accused conduct. For example, I understand from counsel that Arizona does not contend that Google acted improperly when a user enables app-level location permissions (i.e., when an app is launched by the user).⁹⁸ In addition, in discussing the 2018 AP Article, Dr. Levy does not claim any alleged deception when a user purchases an Android product and disables WAA, nor does he address situations in which a user has LH or Device Location enabled as an alleged deception.⁹⁹ Instead, he focuses on a specific scenario in which a user has WAA turned on and Device Location and LH turned off, while acknowledging the fact that not all users have that particular combination of settings (while at the same time ignoring that difference for purposes of his assumption that all location-related revenue should be disgorged, even if obtained from users who did not have settings based on the accused conduct).¹⁰⁰

⁹⁸ Rather, I understand that the operative claim is that Google apps can obtain location information when app-level permissions are denied.

⁹⁹ Levy Report, p. 58 (referencing the situation in which Google allegedly “collects location information through the WAA setting” even if LH is turned off).

¹⁰⁰ Levy Report, p. 60 (which should be the missing page 59) and Table 7.12.

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75. Moreover, even for certain configurations, under which Google may be able to collect some location information from users solely through publicly available information, such as location data associated with an IP address, the information Google would be able to use is sufficient for purposes of the coarse location data that Google uses to target ads.¹⁰¹ For example, when the device-level Device Location is turned off by the user, Google uses coarse location data (such as can be inferred from IP address) for advertising purposes.¹⁰² Given that there are configurations of settings that do not constitute accused conduct, the Levy Report errs in assuming that every user in Arizona was exposed to the accused conduct and therefore *all* revenue from geotargeted ads should be disgorged. Moreover, even if for the sake of argument we assume that a particular user was exposed at a certain point in time, the Levy Report errs in assuming that the exposure is continuous during the entire span of time (Q4 2013-2021). As a consequence, the Levy Report overstates the magnitude of disgorgement for these two reasons, among others.

76. In fact, there is reason to believe that any exposure, should it exist at a point in time, did not span the entire damages period. For example, the Help Center page that is central to Arizona's claims about LH was updated in October 2018 to notify users that location data could be saved in WAA.¹⁰³ Similarly, on-device disclosures concerning

¹⁰¹ Based on my conversation with Karin Hennessy.

¹⁰² Complaint, ¶ 89.

¹⁰³ I understand that the language accused in the Complaint "with location history off, the places you go are no longer stored" was removed as of August 2018.

WAA also began to include references to location storage in the first-level disclosure in late 2018. Dr. Levy does not consider these changes and simply assumes the accused conduct spans the entire period from Q4 2013 through 2021.

77. If the court finds that certain configurations of the settings or certain time periods that Arizona accuses are in fact lawful, then the quantification of disgorgement set forth in the Levy Report cannot provide an accurate estimate of the disgorgement damages. (And there is no ambiguity about the direction of the error: the Levy Report overstates disgorgement.)

78. Notably, the Levy Report claims that “Google has not offered documents or written responses to support some sort of apportionment” in spite of the fact that, as part of his civil penalty calculations, the Levy Report references (and relies on) Google’s written responses on July 12, 2021 to Rule 30(b)(6) Questions 19 and 23 to support his statement that [REDACTED] of Google user accounts had WAA on and LH turned off between 2018 and 2021.¹⁰⁴ Dr. Levy does not consider these data for his disgorgement calculations, nor does he conduct similar analyses on other configurations to estimate the proportion of Arizona users that were potentially exposed to the accused conduct.

¹⁰⁴ Levy Report, pp. 29, 60 (which should be the missing page 59).

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2. Dr. Levy does not address whether users in Arizona who were exposed to the accused conduct were in fact misled by the conduct and, if misled, would have different settings once they understood the loss of beneficial services that are connected to the accused conduct

79. The Levy Report does not address whether users who were exposed to the accused conduct (i) were misled by it or (ii) would have elected into the same location-based settings in the absence of the accused conduct once they understood the loss of beneficial services that are connected to the accused conduct. Analyzing deception and materiality (i.e., whether users' behavior changes as a result of the deception) are important inputs to a proper disgorgement analysis—this is because they are essential to (i) determining the number of Arizona users who were affected by the accused conduct, (ii) the duration the accused conduct affected Arizona users, and (iii) the materiality of the injury (indeed, whether those affected by the accused conduct were, net of benefits, injured). For example, even if all relevant users in Arizona were exposed to the accused conduct but none was misled, then Google's accused conduct resulted in no deception, and therefore Google obtained no ill-gotten gains through its advertising. For example, a Google research presentation suggests that not all users would be misled based on findings from a user study that states, "Inherent assumption is 'Google always know [sic] my location.'"¹⁰⁵

¹⁰⁵ GOOG-GLAZ-00275934 - GOOG-GLAZ-00276017 at GOOG-GLAZ-00275982. Dr. Gray includes the slide with this and other findings in his report. See Expert Report of Colin M. Gray, Ph.D., *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, May 4, 2022, p. 14.

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80. Finally, even if all relevant users in Arizona were exposed to the accused conduct and were misled, but none of them would have altered their settings in the absence of the accused conduct (e.g., because the benefits that come with location services outweigh the perceived costs when users are informed), then Google's accused conduct resulted in no differences in Google's ability to collect location data. As a consequence, Google would have obtained no ill-gotten gains and therefore there would be nothing to disgorge.¹⁰⁶ I understand from counsel that Dr. Ghose expresses the opinion that there are benefits to users from location-based services, suggesting that not all users would have different settings in the absence of the accused conduct. For example, some (or most) users may determine the benefits of location for navigating routes in Google maps outweighs any perceived negative effect of sharing such information with Google. For these users, receiving the disclosures to which Arizona claims they were entitled would have had no effect on the user-selected location settings.

81. The Levy Report provides no basis to believe that Google misled Arizona users or that Arizona users would have different settings in the absence of the accused conduct.

82. The ranges of deception and materiality can fall anywhere between none (0 percent) and all (100 percent). The failure by Arizona (either through the Levy Report or on some other source of information) to make a reliable estimate of these parameters

¹⁰⁶ Moreover, assuming for the sake of argument that a certain Arizona user (i) was exposed, (ii) was misled, and (iii) would have different settings if not misled in a particular month, it would be wrong to infer that all three of these factors hold in other months during the eight-year period from Q4 2013 to 2021.

causes the results to be unreliable. Moreover, presuming that the parameters are 100 percent (i.e., that every single Arizona user (i) had LH/DL off and WAA on; and was (ii) misled, (iii) for the entirety of the period of accused conduct, and (iv) would have different settings if not misled) leads inexorably to the fact that the Levy Report overestimates the magnitude of disgorgement.¹⁰⁷

83. I understand Dr. Joel Steckel performed survey research to assess whether Google's users would behave differently if Google's disclosures addressed Arizona's accused conduct. I understand Dr. Steckel found no statistically significant difference in users turning off WAA after they were prompted to change settings after seeing the allegedly misleading or modified disclosure. This evidence suggests that the share of users who were misled and would have different settings if not misled is not statistically different from zero.

84. Further, observational data suggest that users do not find the LH disclosure to be material. I reviewed data produced by Google relating to WAA on and off events.¹⁰⁸ The data indicate that Google's updates to its LH disclosure in October 2018, which added discussion about location in WAA and clarified that disabling LH still meant that location

¹⁰⁷ If only one Arizona user fails to meet any one of the four prongs, disgorgement is overestimated in the Levy Report. If only a few percent of Arizona users fail to meet at least one of the prongs, then the Levy Report materially overestimates disgorgement—even accepting all other elements of the disgorgement analysis.

¹⁰⁸ Rule 30(b)(6) Written Questions & Responses, *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, July 12, 2021 ("30(b)(6) Questions & Responses on July 12, 2021"), pp. 1-21 (Google's response to Question 18).

data may be saved through WAA, was not associated with large changes in user WAA on and off actions.

C. The Levy Report fails to compute the incremental costs of generating revenue from the accused conduct

85. Calculation of disgorgement of profits requires accounting for the costs associated with the purportedly ill-gotten revenues. To the extent revenues that are attributable to the accused conduct can be calculated, the associated costs would also need to be calculated. Costs for consideration include the cost of revenue, selling, general and administrative expenses, research and development expenses, provisions for taxes and potentially depreciation and amortization expenses relating to expenditures used to develop the accused conduct.¹⁰⁹ Also, I understand that Google provides discounts for certain advertising or advertisers. However, the revenue impact provided in Google's studies discussed above does not account for these discounts. Therefore, applying the estimate from a Google user study to Google's revenues (which reflects the discounts) overestimates the impact of the ablation. Additionally, both fixed costs and variable costs that span multiple years should also be properly accounted for in the determination of profits. Since the Levy Report has failed to calculate revenues subject to disgorgement reliably, I am unable to identify and subtract the associated costs. If relevant information

¹⁰⁹ I also note that the operating income provided by Google does not capture all the costs associated with Google's advertising business. See 30(b)(6) Questions & Responses on July 12, 2021, Footnote 2 ("The numbers provided in Google's 'Ads Global Operating Income (Internal Management View)' column do not capture all costs associated with Google's advertising business, such as costs associated with Chrome and Android and unallocated costs managed at the corporate level.").

is disclosed subsequent to this report, I may update my analysis of costs to be subtracted to revenue subject to disgorgement.

86. As an illustrative example of the Levy Report's failure to apply the inputs and assumptions enumerated above, I use Dr. Levy's methodology to estimate disgorgement (which is flawed for all of the reasons I describe above) for the accused conduct relating to the "LH/DL off and WAA on" setting. This analysis is instructive to observe the sensitivity of disgorgement to the inputs and assumptions. I use inputs and assumptions for (1) Google's Arizona ad operating profit for the period Q4 2013 to 2021, which is the period that Dr. Levy used in his disgorgement calculation, (2) the subset of Google's advertising operating profit for Q4 2013 to 2018, the period during which the accused conduct was included in Google's disclosures,¹¹⁰ (3) an appropriate measurement of the percentage difference in Google's operating profit between the actual and counterfactual worlds, and (4) the share of Arizona Google users exposed to the accused conduct relating to the "LH/DL off and WAA on" setting. Based on this illustrative example for these four inputs, which does not reflect all of the inputs and assumptions required to calculate disgorgement, I calculate interim operating profits subject to disgorgement, based on these four factors, to be approximately [REDACTED].



87. Three more factors, which I do not apply to the calculation above, include (5) an estimate of the share of Arizona Google users who were misled and who would

¹¹⁰ While I understand that some accused conduct is alleged to have continued after 2018, I understand that, in October 2018, the LH disclosure that is central to Arizona's claims ceased to include the accused language and added additional explanatory language disclosing that WAA separately stored location information.

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have different settings if not misled, (6) the share of Google's operating profit generated in connection with a sale or advertisement, and (7) Google's profits after accounting for all relevant costs. While these three factors (items 5-7) are not addressed quantitatively, the Levy Report's assumption that these are each 100 percent has no basis, and evidence supports that each would be less than 100 percent, which would further reduce the disgorgement quantification. In fact, as to item 5, the evidence from Dr. Steckel's survey suggests that the share of Arizona Google users who were misled and who would have different settings if not misled is statistically no different from zero. Because there is no statistical basis to believe users were misled by the accused conduct, it is inappropriate to use an input of 100 percent as implied in the Levy Report.

88. In the table below, I provide a summary of the disgorgement inputs and assumptions, along with the source and explanation, for the items discussed above.

	Disgorgement Inputs and Assumptions	Calculation	Source/Explanation
1	Google's Arizona Ad operating profit, Q4 2013-2021		<ul style="list-style-type: none">Levy Report, Table 7.5¹¹¹
2	Google's Arizona Ad operating profit, Q4 2013-2018, to reflect duration of accused conduct		<ul style="list-style-type: none">Reflecting the change in the Help Center disclosure in October 2018 to notify users that location data

¹¹¹ Although I understand personalized location information is not commonly used for geotargeting of Google Display ads, and therefore there is no evidence supporting disgorgement for Google Display ad revenue or profits, I include both Search and Google Display ad revenue and profits in my calculation.

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			could be saved in WAA ¹¹²
3	Percentage difference in operating profit if location personalization were removed	██████████	<ul style="list-style-type: none"> • Google Ablation Study: "Location Personalization Impact Estimate for Search Ads"¹¹³ • Potential subtraction for non-accused conduct included in the ██████████ estimate. Not applied to the calculation.
4	Share of Google Arizona users exposed to accused conduct	██████████	<ul style="list-style-type: none"> • Estimate of exposure based on monthly visits to the Google Help Center Page, which contained the allegedly deceptive characterization of WAA location data collection prior to the change in the discussion in October 2018.¹¹⁴ The estimate likely overstates true exposure to the Help Center Page because (1) the measure is based on "monthly global unique visits to the Help Center Page," and counts each

¹¹² Calculation through end of 2018 (remove Dr. Levy calculation of operating income of geotargeted ad revenue after 2018).

¹¹³ GOOG-GLAZ-00313605 - GOOG-GLAZ-00313610.


¹¹⁴ In its interrogatory responses, Google has provided the number of "global unique visits" to the Help Center Page from May 2016 to July 2021. *See* Defendant Google LLC's Responses to Plaintiff's Interrogatories, Set Five, Google's Responses to Interrogatories, *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, August 16, 2021, pp. 7-9 ("Response to Interrogatory No. 20"). Prorating the number of visits to the full calendar year based on the available data, I estimate a total of ██████████, and ██████████ "global unique visits" in 2016, 2017, and 2018, respectively. Using the percentages as provided in the Levy Report, Table 7.1, Column [C] as a proxy for the share of U.S. visits, I estimate a total of ██████████, and ██████████ "unique visits" in the U.S. in 2016, 2017, and 2018, respectively. Dividing the number of "unique visits" in the U.S. by the average number of Android users in the U.S. as reported in the Levy Report, Table 7.8, Column [B], I estimate an exposure percentage of ██████████, ██████████, and ██████████ as of each year, with an average of ██████████ from 2016 to 2018.

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			visit as a separate “exposure,” despite the fact that the same user may visit the Help Center Page multiple times in a given year; and (2) it assumes that every visit to the Help Center Page was made by a signed-in user, and that every signed-in user who visited the Help Center Page was exposed to the accused conduct relating to the “LH/DL off and WAA on” setting (as opposed to reviewing other topics addressed on the Help Center Page that are not part of the accused conduct).
5	Share of Google’s Arizona users misled and would have different settings if not misled	Zero, no statistical difference	<ul style="list-style-type: none"> The Steckel Report estimates the difference of shares of “Respondents Who Keep ‘Location History’ Off, and [...] Turn ‘Web & App Activity’ off” between respondents exposed to (1) “amended disclosure” and (2) “original 2018 disclosure.” He finds no statistically significant difference in shares and therefore there is no basis for any disgorgement.¹¹⁵
6	Share of Google’s operating profit	No input	<ul style="list-style-type: none"> The Levy Report assumes 100 percent without evidence.

¹¹⁵ Steckel Report “Google WAA Survey” Exhibits. The survey results show a two percentage point difference (that Steckel concludes is not statistically significant) in WAA-off rate between participants who viewed the original disclosure versus the amended disclosure. I also note that Google’s July 12, 2021 30(b)(6) responses for WAA off events show a small change after the October 2018 change in disclosure. See 30(b)(6) Questions & Responses on July 12, 2021, pp. 8-14.

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	generated in connection with a sale or advertisement		
7	Google's profits after accounting for all relevant costs	No input	<ul style="list-style-type: none">• The Levy Report assumes 100 percent without evidence.
8	Interim profits subject to disgorgement, prior to application of factors 5-7.		<ul style="list-style-type: none">• $[8] = [2] * [3] * [4]$

IV. DR. LEVY'S CIVIL PENALTIES ANALYSIS IS FLAWED AND UNRELIABLE

89. In this section, I address the Levy Report calculations relating to civil penalties. In subsection A, I explain why Dr. Levy's assessment of the number of violations is flawed. In subsection B, I explain why Dr. Levy's penalties analysis is flawed. As a result, Dr. Levy's calculations cannot be held to a reasonable degree of certainty and should not be credited.

A. Dr. Levy's assessment of the "number of violations" is flawed and grossly inflated, and therefore unreliable

90. The Levy Report describes four theories relating to the accused conduct by Google.¹¹⁶ None of these "theories" is appropriate for quantifying the number of Google's

¹¹⁶ Levy Report, p. 49. The four "different theories to explain how many different 'violations' there have been by Google" are: (1) "the number of Android users in Arizona," (2) "the number of Google-licensed Android devices sold in Arizona," (3) "the number of ad impressions delivered in Arizona" and (4) "the number of Google Accounts associated with users in Arizona."

purported violations of the ACFA, and all are inconsistent with the Levy Report's approach to quantifying disgorgement.

91. I note that the quantification of disgorgement in the Levy Report purports to be based on an assessment of Google's revenue and profits that are "causally connected" to the enumerated violation instances that Arizona alleges constitute Google's accused conduct. This notwithstanding, the Levy Report does not include any assessment of whether, and how many, users are deceived or harmed (and when the deception and/or harm commenced and ceased).

92. Even though it claims to do so, the Levy Report does not measure Google's revenue arising from the accused conduct.¹¹⁷ In other words, the Levy Report's disgorgement analysis purports to be based on revenues that make use of user location information that Google collected or stored based on accused conduct but, in fact, it is not. The Levy Report disgorgement calculation does not incorporate information on the number of Android users, the number of Android devices, the number of ad impressions, or the number of Google Accounts. It is the accused improper settings and setting-related practices that underlie his disgorgement analysis, and it is inconsistent for him to choose to ignore those factors here when analyzing civil penalties.

93. If the number of Arizona consumers who have been harmed by an ACFA violation is the appropriate measure of the number of "violations," an expert should

¹¹⁷ Levy Report, p. 29 ("For my disgorgement calculations, I first set out to determine Google's revenue in Arizona that makes use of the consumer location information collected through the unlawful practices alleged by the State.").

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enumerate the specific location-related settings and practices at issue—e.g., (i) the number of consumers in Arizona who have been exposed to the accused conduct (here, allegedly wrongful settings), (ii) of those exposed, the number who have been deceived into enabling the allegedly wrongful settings, and (iii) of those in (ii), the number who would have had different settings but for the accused conduct. By not addressing these issues directly, the Levy Report is implicitly assuming that 100 percent of the Arizona consumers included in his analysis (i) have been exposed to accused conduct, (ii) have been misled by that conduct, and (iii) would have selected different settings if not misled. However, the Levy Report does not provide any analysis of these points and therefore has provided no reliable information pertaining to the number of alleged ACFA violations.

94. Furthermore, Dr. Levy's calculations of the number of Android users in Arizona (based on the number of active Android smartphones in Arizona) have three flaws that inflate his estimates and therefore make his estimates unreliable.

95. First, Dr. Levy adds together the number of active Android smartphones for each year to arrive at a total number of active Android smartphones across the period Q4 2013-2021. However, the data on active Android smartphones is based on the total number of Android smartphones active at some point during the given year, not on the number of new Android smartphones activated during the year. Because Dr. Levy sums the number of Android smartphones across all years, he is repeatedly counting the same active Android smartphone multiple times in the eight-year period. Moreover, Dr. Levy does not (and makes no attempt to) account for the fact that many Android smartphones

were active during more than one year in the period. This is not a technical criticism: It is easy to see that Dr. Levy overstates active smartphones in Arizona by comparing his estimated smartphone count (26.05 million Android users during Q4 2013-2021) with Arizona's total population in 2020 (7.2 million).¹¹⁸ It is implausible that on average Arizona residents possess almost four active Android phones each. The Arizona population count includes infants, young children, elderly in nursing homes, the indigent, as well as iPhone users.

96. Second, Dr. Levy calculates the number of "Android Users" by relying upon data produced by Google that provides the number of active smartphones with an Android operating system.¹¹⁹ As Google states in the document that Dr. Levy relies upon for this calculation, the number of Android smartphones is "not indicative of the true number of users, as a user may use multiple Android devices."¹²⁰ Therefore it is likely that Dr. Levy's "number of active smartphones" measure overstates the number of Android users.

97. Third, Dr. Levy's calculations for the number of active Android smartphones do not show that any (and if so, how many) of these smartphones were subject to the accused conduct. For example, it is possible that some number of these

¹¹⁸ According to the U.S. Census Bureau, the population of Arizona was 7,151,502 in April of 2020. See United States Census Bureau, "QuickFacts: Arizona," available at <https://www.census.gov/quickfacts/AZ>.

¹¹⁹ Levy Report, Table 7.8, "Calculation of Monthly Arizona Android Users."

¹²⁰ Supplemental 30(b)(6) Written Responses, *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, March 28, 2022, p. 1.

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devices were used with non-Google apps and services, and not for access to any of Google's services. Additionally, there are differences between Google's Pixel devices and other non-Google Android devices. For example, the Device Location toggle on Google Pixel devices differs from other non-Google Android devices. To offer a reliable quantification of a remedy, Dr. Levy should make some accounting for exposure to the alleged violations and/or demonstrate some linkage to the alleged violations in order to justify inclusion of these devices in his violations calculations.

98. Next, Dr. Levy's calculation of the number of Android devices sold in Arizona (based on the number of Android devices activated in Arizona) is unreliable because he demonstrates no exposure or other linkage with the alleged violations. As is the case for his active Android smartphones calculation, Dr. Levy's calculations for the number of Android activations implicitly assumes that 100 percent of the users who activated Android devices in Arizona (i) have been exposed to accused conduct, (ii) have been misled by that conduct, and (iii) would have different settings if not misled. Dr. Levy does not show that any of these activations were subject to any of the accused conduct enumerated by Arizona. For example, it is possible that some number of these devices were activated but never used, or were activated and used exclusively for phone calls but not for access to any of Google's services. To offer a reliable quantification of a remedy, Dr. Levy should make some accounting for exposure to the alleged violations and/or demonstrate a causal linkage to the alleged violations in order to justify inclusion of these device activations in his violations calculations.

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99. Dr. Levy's calculation for the number of violations as measured by ad impressions delivered in Arizona is based on the flawed assumption that Google provides at most one ad impression for each time Google infers a user's location.¹²¹ This assumption causes Dr. Levy to overstate his estimate of the number of violations as measured by the number of ad impressions. Dr. Levy's measure is imprecise and likely overstates the number of times Google captures or utilizes a user's location information, because the total number of ad impressions is not a reliable measure for this definition of a violation. This is made evident by Dr. Levy's unsubstantiated assertion that "[t]he number of impressions, however, is lower than the number of times a user trades location for Google's services. Google does not necessarily serve ads each time a user interacts with Google's services, however, Google takes that user's location."¹²² But Dr. Levy ignores the fact that Google may also serve multiple ads (i.e., multiple impressions) for a single user interaction. For example, a search for "plane tickets" on Google Search via a browser on iOS returned nine ads. A search for "data recovery" on Google Search on a browser on MacOS returned seven ads on the first page of results, and an additional seven ads on the second page of results. So, while it may be true that Google does not provide an ad every time it provides a service that utilizes a user's location, Dr. Levy provided no analysis to support his assertion that this fact necessarily implies that the number of ad impressions is less than the number of occasions in which Google utilizes

¹²¹ I also note that not all location information collected by Google is based on accused conduct, as discussed above.

¹²² Levy Report, p. 53.

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a user's location information to provide a service to that user. Without an analysis that accounts for the fact that Google may serve more than one ad impression per user interaction, there is no basis to believe Dr. Levy's analysis is accurate. Moreover, this is another example in which Dr. Levy's measure of the disgorgement overstates the actual revenues arising from the accused conduct.

100. Dr. Levy's calculation of the number of violations based on the number of Google accounts incorrectly counts the same accounts multiple times, which makes his calculation unreliable. Dr. Levy adds together the number of Google accounts for each year to arrive at a total number of Google accounts across the period Q4 2013-2021. But this means that Dr. Levy is counting the same accounts multiple times in the eight-year period. Dr. Levy does not incorporate the fact that many accounts (likely the majority of accounts) existed in more than one year. Without further justification and/or additional data, the upper bound to the number of unique Google accounts that existed during the period is 6.4 million accounts, which assumes that all users kept their account open from the time the account was created through 2021. Dr. Levy's calculation of 22.58 million accounts appears to be a gross overestimate. It is implausible that the average Arizona resident possessed over three Google accounts (as of 2020).¹²³ Further, Dr. Levy's calculations of the number of violations based on the number of Google accounts implicitly assumes that 100 percent of the users who have Google accounts in Arizona (i)

¹²³ According to the U.S. Census Bureau, the population of Arizona was 7,151,502 in April of 2020. See United States Census Bureau, "QuickFacts: Arizona," available at <https://www.census.gov/quickfacts/AZ>.

have been exposed to accused conduct, (ii) have been misled by that conduct, and (iii) would have different settings if not misled. Dr. Levy does not show that any of these users with Google accounts were subject to any of the accused conduct enumerated by Arizona.

101. For these reasons, Dr. Levy's quantification of the "number of violations" is flawed and grossly inflated, and therefore unreliable. Thus, it cannot be held to a reasonable degree of certainty.

B. Dr. Levy's assessment of the "amount of penalties" is flawed and unreliable

102. Dr. Levy states he is advised there are six factors that "may inform the jury's consideration as to the amount of penalties that should be imposed per violation in the event that the jury concludes such penalties are warranted."¹²⁴ He discusses three of those factors and does not express an opinion on the remaining three.¹²⁵ Notably, Dr. Levy has failed to address "harm to the public," notwithstanding at least two points in his report that invite such an analysis: first in connection with calculating restitution damages and second in the factors he identified as relevant to determining civil penalties. Thus, Dr. Levy twice declined to provide any evidence or calculations, or even any commentary, on whether or not Google users in Arizona have been harmed (and, if so, to what economic extent). I understand from counsel that Dr. Ghose expresses an opinion in this

¹²⁴ Levy Report, p. 54.

¹²⁵ Dr. Levy does not discuss: (1) the good or bad faith of the defendants, (2) harm to the public, and (3) the necessity of vindicating the authority of the government entity or agency authorized to seek the penalties. *See* Levy Report, p. 54.

matter that users benefit from location services and location-based targeted advertising, and that Arizona has not provided systematic evidence of harm to consumers. Users of Google's devices and services in Arizona have used, and continue to use, Google devices and services because those devices and services provide them with valuable benefits. Indeed, in the case of Google services, those benefits are largely provided by Google to Arizona residents at a price of zero dollars. Furthermore, Dr. Levy has not demonstrated that any consumers have been misled or would have different settings if not misled.

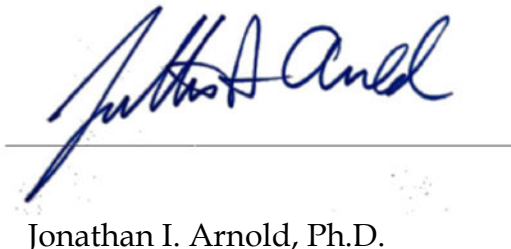
103. With regard to the factors that Dr. Levy does discuss,¹²⁶ his calculations are irrelevant and/or unreasonable. Dr. Levy's analyses for ability to pay and deterrence effect are based on Google's and Alphabet's global financials. Since the current matter applies exclusively to Arizona, any assessment of Google's ability to pay should be calibrated to Google's revenues and profits derived from the state of Arizona, and not from the United States or globally.

104. Finally, Dr. Levy's recommendation for sizing the penalty such as to eliminate any benefits to Google is simply to use his disgorgement calculations. Setting aside whether or not his recommendation is conceptually appropriate, the recommendation to utilize his disgorgement estimates is flawed for all the reasons his disgorgement analysis is flawed. Regarding his conceptual argument, Dr. Levy references research by Professor Gary Becker that concludes the size of a penalty should

¹²⁶ Dr. Levy discusses: (1) the ability of Google to pay any penalties, (2) eliminating the benefits to Google (gained from any unlawful practices), and (3) the deterrence effect of any penalty (to discourage Google, or others, from pursuing unlawful practices in the future). *See* Levy Report, p. 54.

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be larger when the probability of conviction is lower and references his understanding that the accused conduct “has been on-going since 2013,” but the AP article was published in 2018.¹²⁷ The Levy Report implies, without basis, that the passage of time reflects that Google concealed the accused conduct. Indeed, Dr. Levy does not provide basis for any such purported concealment or other basis for his conclusions. Google’s change to its LH disclosure around October 2018 had a small effect on WAA off events, suggesting the accused conduct was not material.¹²⁸ For these reasons, his opinion on sizing the penalty to eliminate any benefits to Google is unreliable and cannot be held to a reasonable degree of certainty.

A handwritten signature in blue ink, reading "Jonathan I. Arnold", is positioned above a horizontal line. The signature is fluid and cursive.

Jonathan I. Arnold, Ph.D.

June 8, 2022

¹²⁷ Levy Report, pp. 55-56.

¹²⁸ See 30(b)(6) Questions & Responses on July 12, 2021, pp. 8-14.

Appendix A

JUNE 2022

CURRICULUM VITAE

Jonathan I. Arnold, Ph.D.

EDUCATION:

Ph.D. Business Economics, Graduate School of Business, The University of Chicago

M.B.A. Finance and Accounting, The University of Chicago Graduate School of Business

B.A. Economics, The University of Chicago

PROFESSIONAL EMPLOYMENT SINCE 2012:

2013 – Testifying Expert Economist, Chicago Economics Corp.
Senior Consultant, Compass Lexecon

2012 – 2013 *Chief Economist*, Office of the Attorney General, New York State

RECENT TESTIMONY:

- Deposition in *Peaks Capital Partners v. Brunjes*, District Court, County of Miguel, Colorado, Case No. 2019CV30047. (May 2022)
- Expert Report in *Innovatus Capital Partners v. Jonathan Nueman*, U.S. District Court for the Southern District of New York, Case No. 18 Civ. 4252. (May 2022)
- Deposition in *BDO USA v. Everglade Global*, The Court of Chancery of the State of Delaware, C.A. No. 2021-0244. (March 2022)
- Expert Report in *Boeing v. Embraer*, Before the International Centre for Dispute Resolution of The American Arbitration Association, ICDR Ref. No.: 01-20-0005-0591. (March 2022)
- Expert Report in *BDO USA v. Everglade Global*, The Court of Chancery of the State of Delaware, C.A. No. 2021-0244. (February 2022)
- Affidavit in *Western & English Sales Association v. GC Merchandise Mart* (Denver Mart, Intervenor), County of Adams, Colorado, Case No. 2020CV30688. (February 2022)
- Rebuttal Expert Report in *Peaks Capital Partners v. Brunjes*, District Court, County of Miguel, Colorado, Case No. 2019CV30047. (January 2022)
- Affidavit in *Western & English Sales Association v. GC Merchandise Mart* (Denver Mart, Intervenor), County of Adams, Colorado, Case No. 2020CV30688. (January 2022)
- Expert Report in *Western & English Sales Association v. GC Merchandise Mart* (Denver Mart, Intervenor), County of Adams, Colorado, Case No. 2020CV30688. (November 2021)

- Expert Report in *Peaks Capital Partners v. Brunjes*, District Court, County of Miguel, Colorado, Case No. 2019CV30047. (October 2021)
- Trial Testimony in *Proofpoint v. Vade Secure*, U.S. District Court for the Northern District of California, Civil Action No. 3:29-cv-4238. (August 2021)
- Reply Declaration in *Eagle View Technologies v. Xactware Solutions*, U.S. District Court for the District of New Jersey, Civil Action No. 15-cv-07025. (June 2021)
- Revised Second Supplemental Expert Report in *Proofpoint v. Vade Secure*, U.S. District Court for the Northern District of California, Civil Action No. 3:29-cv-4238. (April 2021)
- Deposition in *Proofpoint v. Vade Secure*, U.S. District Court for the Northern District of California, Civil Action No. 3:29-cv-4238. (April 2021)
- Second Supplemental Expert Report in *Proofpoint v. Vade Secure*, U.S. District Court for the Northern District of California, Civil Action No. 3:29-cv-4238. (April 2021)
- Declaration in *Eagle View Technologies v. Xactware Solutions*, U.S. District Court for the District of New Jersey, Civil Action No. 15-cv-07025. (April 2021)
- Trial Testimony in *RCS Creditor Trust v. Nicholas S. Schorsch*, The Court of Chancery of the State of Delaware, C.A. No. 2017-0178-SG. (March 2021)
- Supplemental Expert Report in *Proofpoint v. Vade Secure*, U.S. District Court for the Northern District of California, Civil Action No. 3:29-cv-4238. (March 2021)
- Expert Report in *Proofpoint v. Vade Secure*, U.S. District Court for the Northern District of California, Civil Action No. 3:29-cv-4238. (February 2021)
- Testimony *In the Matter of Certain Tobacco Heating Articles and Components Thereof*, United States International Trade Commission, Washington, D.C., Investigation No. 337-TA-1199. (January 2021)
- Deposition *In the Matter of Certain Tobacco Heating Articles and Components Thereof*, United States International Trade Commission, Washington, D.C., Investigation No. 337-TA-1199. (November 2020)
- Expert Report *In the Matter of Certain Tobacco Heating Articles and Components Thereof*, United States International Trade Commission, Washington, D.C., Investigation No. 337-TA-1199. (October 2020)
- Deposition in *RCS Creditor Trust v. Nicholas S. Schorsch*, The Court of Chancery of the State of Delaware, C.A. No. 2017-0178-SG. (October 2020)
- Deposition in *Langer v. CME Group*, Circuit Court of Cook County, Illinois, County Department, Chancery Division, No. 2014-CH-00829. (August 2020)
- Expert Report in *RCS Creditor Trust v. Nicholas S. Schorsch*, The Court of Chancery of the State of Delaware, C.A. No. 2017-0178-SG. (June 2020)
- Reply Declaration in Support of Permanent Injunctive Relief and a Bond in *Eagle View Technologies v. Xactware Solutions*, U.S. District Court for the District of New Jersey, Civil Action No. 15-cv-07025. (December 2019)

- Expert Declaration in *Langer v. CME Group*, Circuit Court of Cook County, Illinois, County Department, Chancery Division, No. 2014-CH-00829. (November 2019)
- Declaration in re *Akorn Data Integrity Securities Litigation*, U.S. District Court for the Northern District of Illinois, Eastern Division, Civil Action No. 1:18-cv-01713. (October 2019)
- Declaration in Support of Permanent Injunctive Relief and a Bond in *Eagle View Technologies v. Xactware Solutions*, U.S. District Court for the District of New Jersey, Civil Action No. 15-cv-07025. (October 2019)
- Jury Trial Testimony in *Eagle View Technologies v. Xactware Solutions*, U.S. District Court for the District of New Jersey, Civil Action No. 15-cv-07025. (September 2019)
- Trial Testimony in re Transcare (Debtor) in the matter of *Salvatore Lamonica, as Chapter 7 Trustee for the Estates of TransCare v. Lynn Tilton*, U.S. Bankruptcy Court, Southern District of New York, Chapter 7 Case No. 16-10407. (August 2019)
- Deposition in re Transcare (Debtor) in the matter of *Salvatore Lamonica, as Chapter 7 Trustee for the Estates of TransCare v. Lynn Tilton*, U.S. Bankruptcy Court, Southern District of New York, Chapter 7 Case No. 16-10407. (July 2019)
- Trial Testimony in re Transcare (Debtor) in the matter of *Salvatore Lamonica, as Chapter 7 Trustee for the Estates of TransCare v. Lynn Tilton*, U.S. Bankruptcy Court, Southern District of New York, Chapter 7 Case No. 16-10407. (July 2019)
- Supplemental Expert Report in *Eagle View Technologies v. Xactware Solutions*, U.S. District Court for the District of New Jersey, Civil Action No. 15-cv-07025. (May 2019)
- Deposition in re Transcare (Debtor) in the matter of *Salvatore Lamonica, as Chapter 7 Trustee for the Estates of TransCare v. Lynn Tilton*, U.S. Bankruptcy Court, Southern District of New York, Chapter 7 Case No. 16-10407. (March 2019)
- Declaration in *Class v. Samsung Telecommunications America*, U.S. District Court, Northern District of California, Case No. 3:14-cv-582-JD. (January 2019)
- Trial Testimony in *Jo Ann Howard and Associates v. J. Douglas Cassity*, U.S. District Court, Eastern District of Missouri, Case No. 09-CV-1252-ERW. (January 2019)
- Expert Report in re Transcare (Debtor) in the matter of *Salvatore Lamonica, as Chapter 7 Trustee for the Estates of TransCare v. Lynn Tilton*, U.S. Bankruptcy Court, Southern District of New York, Chapter 7 Case No. 16-10407. (November 2018)
- Rebuttal Expert Report in *Jo Ann Howard and Associates v. J. Douglas Cassity*, U.S. District Court, Eastern District of Missouri, Case No. 09-CV-1252-ERW. (November 2018)
- Expert Report in *U.S.A. v. Matthew Connolly and Gavin Black*, U.S. District Court, Southern District of New York, Case No. 01:16-CR-00370 (CM). (September 2018)
- Deposition in *Jo Ann Howard and Associates v. J. Douglas Cassity*, U.S. District Court Eastern District of Missouri, Case No. 09-CV-1252-ERW. (August 2018)
- Expert Report in *Jo Ann Howard and Associates v. J. Douglas Cassity*, U.S. District Court Eastern District of Missouri, Case No. 09-CV-1252-ERW. (July 2018)

- Deposition in *Eagle View Technologies v. Xactware Solutions*, U.S. District Court for the District of New Jersey, Civil Action No. 15-cv-07025. (May 2018)
- Expert Report in *State of Washington v. LG Electronics*, Superior Court of King County, Washington, Case No. 12-2-15842-8. (May 2018)
- Rebuttal Expert Report in *Eagle View Technologies v. Xactware Solutions*, U.S. District Court for the District of New Jersey, Civil Action No. 15-cv-07025. (May 2018)
- Expert Report in *Eagle View Technologies v. Xactware Solutions*, U.S. District Court for the District of New Jersey, Civil Action No. 15-cv-07025. (May 2018)
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- Court Testimony *In the Matter of Certain Two-Way Radio Equipment and Systems, Related Software and Components Thereof*, United States International Trade Commission, Washington, D.C., Investigation No. 337-TA-1053. (January 2018)

OTHER:

Certified Public Accountant

Appendix B

Materials Considered

Court Documents

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Declaration of Seth Nielson, *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, November 16, 2021.

Defendant Google LLC's Responses to Plaintiff's Interrogatories, Set Five, Google's Responses to Interrogatories, *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, August 16, 2021.

Expert Report of Colin M. Gray, Ph.D., *State of Arizona v. Google, LLC*, Superior Court of Arizona, Maricopa County, Case No. CV2020-006219, May 4, 2022.

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GOOG-GLAZ-00275934 - GOOG-GLAZ-00276017.

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Eric Griffith, "How to Find Your IP Address," March 7, 2021, available at <https://www.pcmag.com/how-to/how-to-find-your-ip-address>.

Geo Targetly, "Location Accuracy," available at <https://help.geotargetly.com/en/articles/1238962-location-accuracy>.

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Google, "Helpful products. Built with you in mind," available at <https://about.google/products/>.

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Google, "Reach a larger or new audience with Google Display Network targeting," available at https://ads.google.com/intl/en_id/home/resources/reach-larger-new-audiences/.

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Other

Conversation with Ingemar Eriksson.

Conversation with Karin Hennessy.

Conversation with Pallavi Anderson.

Steckel Report "Google WAA Survey" Exhibits.